

**NASA Science Mission Directorate,  
Space Technology Program, and  
Office of the Chief Engineer**

**HANDS-ON PROJECT  
Experience (HOPE)  
2012**

**Training Opportunity  
For  
NASA Personnel**

Fourth Call (HOPE-4)

Release date	November 19, 2012
Notices of Intent deadline	December 28, 2012
Proposal deadline	February 25, 2013



## **HANDS-ON PROJECT EXPERIENCE (HOPE) TRAINING OPPORTUNITY**

### **FOREWORD**

The Science Mission Directorate (SMD), in collaboration with the Space Technology Program (STP) and the Office of the Chief Engineer (OCE)/Academy of Program/Project and Engineering Leadership (APPEL), is releasing this Hands-On Project Experience (HOPE) Training Opportunity (TO) to solicit NASA Center proposals to develop an in-house Project Team that will fly an Earth or space science or technology payload on any suborbital-class platform including sounding rocket, balloon, aircraft (piloted, unmanned, or parabolic), CubeSat, or commercial suborbital reusable launch vehicle. The Centers are encouraged to embrace this training opportunity for early career hires and interleave it with the Center's own training program in order to develop future program and project leaders.

The primary goal of this solicitation is:

- To provide a hands-on Training project to enhance the technical, leadership, and project knowledge, skills and abilities for the selected NASA in-house Project Team. This goal is expected to be accomplished (i) by developing a comprehensive Training Plan for an appropriately experienced team of early career NASA personnel representing the broad diversity of functions of the center (science, technology, engineering, training, business, administration), and (ii) with structured coaching and mentoring by Center experts, and (iii) supported by just-in-time informal and formal training targeted toward individual team member learning needs that support the success of the project, and (iii) with lessons learned and knowledge sharing for the Center and the Agency.

The secondary goal of this solicitation is:

- To fly an Earth or space science payload having a useful purpose for SMD, or to mature or develop a space related technology having a useful purpose to either SMD or to STP.

The maximum funding available from SMD for a proposed effort including the design, development, integration and test, and flight of the payload is \$800K in Real Year dollars for both procurement and civil servant labor, including any cost of the carrier. This funding may be supplemented with contributions by the implementing NASA Center(s) (no limit). SMD in collaboration with STP and OCE/APPEL expect to select one project for implementation, subject to available funding. The selected project must be launch or flight-ready within the period of 15-18 months from the selection date, with submittal of preliminary data analysis and the final report to SMD 3 months after the flight is completed.

In order to ensure the primary goal of this solicitation, and notwithstanding the low cost approaches being employed, every effort will be made to try to make the project experience provided by this training as similar as possible to that of larger flight projects from the proposal to selection to implementation. The proposal submission process is considered the first step in meeting the learning objectives of the HOPE Project. As much as practicable, this TO will follow the requirements of an Announcement of Opportunity (AO) so as to support proposers in gaining experience in responding to future NASA AOs.

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## **HANDS-ON PROJECT EXPERIENCE (HOPE) TRAINING OPPORTUNITY**

### **1. Description of Training Opportunity**

#### **1.1 Introduction**

SMD, in collaboration with STP and OCE/APPEL, is issuing this Training Opportunity (TO) for the purpose of soliciting proposals for in-house NASA Center teams to design, develop, and fly science/technology payloads (see Section 5.2) on a sounding rocket, balloon, aircraft (piloted or unmanned), CubeSat, or commercial suborbital reusable launch vehicle. (In the context of this document the term payload will be used to refer to a payload or experiment including technology development.) All proposals submitted in response to this solicitation must support the goals and objectives of this solicitation (see Foreword and Section 2) and must be implemented by an in-house NASA Center Project Team (Section 4.2), where it is understood that a NASA Center Project Team could be a multi-Center team and that the Jet Propulsion Laboratory (JPL) is one of the ten NASA Centers eligible to propose. The Centers are encouraged to embrace this opportunity and interleave it with the Center's own training program in order to develop future program and project leaders. Proposal teams are encouraged to utilize their Center proposal development office.

Proposals will be evaluated and selected through the process described in Section 7. SMD in collaboration with STP and OCE expects to select one project for implementation, subject to available funding.

Appendix A provides a table summary of the proposal requirements listed in this TO. Appendix B provides points of contact for each of the provided carriers and examples of the carrier capabilities and services available through the Sounding Rocket, Balloon, Airborne Science, CubeSats, and commercial suborbital reusable launch vehicles for this project. Other commercial or reusable suborbital carrier providers can be proposed. Appendix C provides Training Guidelines and Best Practices for HOPE Projects. Appendix D provides a list of Frequently Asked Questions (FAQ), along with the answers.

#### **1.2 Major Changes from the Last TO**

The major changes from the last TO are:

- Added 3 additional months to the project period of performance. The selected project must be launch or flight-ready within the period of 15-18 months from the selection date.
- Expanded the secondary goal to include flying a payload to mature or develop a space related technology having a useful purpose to STP.
- Training Guidelines and Best Practices are described in Appendix C.
- A training professional must be included as an active member of the HOPE project team.
- Proposals must be identified as either Science or Technology proposals to aid reviewers.
- There is no funding supplement for use of a sounding rocket as the carrier.
- Poker Flat Research Range (Alaska) is added as a Sounding Rockets launch location.

## 2. Enabling SMD's Goals and Objectives through Science and Technology

It has become increasingly apparent that NASA should develop and maintain an in-house core of highly experienced and competent technical project personnel to achieve its strategic objectives, and that with growing demands on the NASA budget, there are fewer opportunities to obtain grassroots, hands-on flight project experience for early career NASA personnel. The primary goal of this solicitation is to provide a training opportunity for obtaining hands-on experience of proposing, designing, developing, and flying a small mission to enhance the technical, leadership, and project skills of the selected Project Team. As a secondary goal, SMD, STP, and OCE expect that this flight project would include a science or technology payload (see Section 5.2) that would be beneficial to the goals and objectives of SMD or STP. SMD's goals and objectives are described in the *2010 NASA Science Plan* and its supporting roadmap documents. STP's goals and objectives are described in the *2012 NASA Space Technology Roadmaps and Priorities*. This opportunity will be afforded to the selected NASA Center Project Team.

## 3. Training Opportunity Milestones

The following schedule describes the major milestones for this TO:

TO Release Date .....	November 19, 2012
Q&A Telecon.....	December 7, 2012
Notice of Intent (NOI) to Propose Deadline .....	December 28, 2012
Proposal Submittal Deadline.....	February 25, 2013(11:59 PM EST)
Selections Announced (target).....	May 17, 2013
Launch/Flight Readiness.....	September 30, to December 31, 2014

**Requirement 1.** Proposals submitted in response to this solicitation shall be delivered no later than the associated deadline and shall be delivered to the Address for Submittal of Proposals given in Section 6.1.3.

## 4. Policies Applicable to this TO

The following policies apply to the Training Opportunity described herein.

### 4.1 NASA Management Policies

#### 4.1.1 NASA Flight Program and Project Management Requirements

Proposals must be in conformance with the NASA project management processes, as defined by NASA Procedural Requirements (NPR) 7120.5E, *NASA Space Flight Program and Project Management Requirements*, and NPR 7123.1A, *NASA System Engineering Processes and Requirements*. These standard management processes are, Formulation, Approval, Implementation, and Evaluation. ***The requirements in NPR 7120.5E however, should be appropriately tailored depending on the project size, complexity, and scope.***

#### 4.1.2 Management Responsibilities

SMD/STP/OCE intends to maintain an essential degree of oversight of the project development. To that end, the Associate Administrator for SMD in collaboration with STP and OCE has established that the Earth System Science Pathfinder (ESSP) Program Office at the NASA Langley Research Center will provide the programmatic oversight for this effort.

The NASA Evaluations, Assessments, Studies, Services, and Support (EASSS) contract with Earth Resources Technology Inc. (ERT) creates an unmitigatable organizational conflict of interest for ERT in the event that any business unit of ERT has a proposed role as prime contractor, subcontractor, or participating organization. Because of this organizational conflict of interest, ERT is precluded from participating in any capacity in support of a respondent under this TO.

The NASA Center where the project (or Team Leader for multi-center projects) is located has the primary responsibility for ensuring the successful completion of the project. The implementing project management organization must be prepared to carry out this responsibility. The independent technical authority for the project will also be located at the implementing Center.

Since the primary goal of this TO is to provide a training opportunity for less experienced individuals, the Center must support the project by providing the additional necessary training and personnel oversight and guidance to ensure a successful mission. A mentor must be assigned to each early career NASA personnel team member. The proposal therefore must show that the implementing Center is prepared to carry out this responsibility (see Requirement 20).

#### 4.2 Participation Policies

##### 4.2.1 Eligibility to participate in this TO

Prospective project teams can be composed only of in-house NASA Center (NASA badged) personnel. This TO is open to all Centers, but benefitting multiple Centers is a key strategic objective as complex, multi-Center programs and projects are the way of the future for NASA. Smaller Centers are expected to be able to equally compete for this opportunity through partnering. The team can be comprised of NASA civil servants (or Lab employees for JPL) including early career personnel working at the Center. Center contractors can be used for project implementation support roles but not in roles of management or leadership. The intent is to include the population of people at the Center who intend to have long-term associations with NASA. Early career personnel could include NASA Postdoctoral Program (NPP) fellows and co-op students, but the proposal must justify why they should be considered “people at the Center who intend to have long-term associations with NASA.”

The proposed project team must also be composed of individuals who will benefit from participation in this training opportunity and whose training will benefit NASA and the Center (see Requirements 16-19).

#### 4.2.2 Technical Constraints on Proposals

Only those proposals that do not exceed the constraints identified in this TO and that demonstrate sufficient margins, reserves, and resiliency to ensure mission success within committed cost and schedule, will be considered for selection (see Requirements 21-31).

#### 4.2.3 Number of Allowable Proposals

Each Center is allowed to submit one training proposal composed solely of personnel from that Center. One additional proposal will be allowed if the second proposal is composed of a team that has participation from multiple Centers (at least one additional Center). Thus, a Center may only *submit* two proposals as the lead Center (if one involves another Center). There is no limit in the number of proposals in which a center may participate. For the purpose of this Training Opportunity, the term “Centers” refers to NASA Centers, JPL, and NASA Headquarters. (Headquarters may not submit a proposal; however, Headquarters personnel may participate in a Center proposal.)

### 4.3 Cost Policies

#### 4.3.1 Requested Funding

*Requested Funding* is defined as the funding that SMD will be expected to provide for the selected Center’s project implementation team for the development and execution of the proposed project, Phases A through F. Requested Funding may not exceed \$800K (RY\$) for procurement and civil servant labor.

#### 4.3.2 Center Contributions

*Center Contributions*, to the proposed effort, of funds, labor, facilities, *etc.* are acceptable and unlimited. There are no set expectations as to the amount of the Center Contributions. These are determined strictly by the Center based on the project needs. These Center Contributions may be applied to any WBS or work element of the proposed project as determined by the Center; however, these contributions must be specifically identified and allocated against the Total Project Cost (see Cost Tables in Section 6.2.1).

#### 4.3.3 Total Project Cost

*Total Project Cost* is defined as the Requested Funding plus any Center Contributions. Examples of costs to be included in the Total Project Cost are: development activities (*e.g.*, instrument development, instrument platform development, management, software, testing); all reserves; carrier and associated services costs; subcontracting costs, including fees; and all other personnel required to develop the payload, conduct the flight, and analyze the data; any project-specific costs; and all labor. Total Project Costs are in terms of funding outlaid; cost proposals do not need to be full cost and do not need to include services that are covered in other budgets (*e.g.*, Center Management and Operations (CM&O)).

Carrier cost is defined as the total cost for the selected carrier and associated services. The carriers include sounding rockets, balloons, aircraft (piloted or unmanned), CubeSats, or commercial suborbital reusable launch vehicles.

Proposers are free to trade within this Total Project Cost for different carriers depending on the needs of the mission. SMD is not holding any reserves against cost growth in the project. If the estimated cost at completion exceeds the proposed Total Project Cost, the proposing Center shall supply the necessary additional funds.

#### 4.3.4 Supplement for Sounding Rocket Projects

There is no funding supplement for a project that uses a sounding rocket as the carrier.

#### 4.4 Data Policies

Project Teams will be responsible for analysis of the mission data necessary to complete the proposed science or technology objectives and, where appropriate, for timely dissemination of any scientific or technical results including presentations at professional conferences and publication in refereed scientific journals, as part of their mission operations activities. Project Teams will be responsible for submittal of preliminary data analysis and the final HOPE Project report to SMD 3 months after the flight is completed. Project learning and development advances should also be considered for publication and presentation. If appropriate, data shall be stored in a NASA data archive. Otherwise, the data shall be made available to the public within a reasonable period of time.

### 5. Requirements and Constraints

This section provides general requirements on proposals. Supplemental requirements on standard proposal content and format are provided in Section 6.2.1.

#### 5.1 Training Requirements

The first goal of this solicitation is to provide a training opportunity for a Hands-On Project Experience to an in-house NASA Center project team. It is intended that this training opportunity will complement and be integrated into the Center's ongoing training for project personnel. Centers are encouraged to use this training opportunity for Center staff in all areas of Center business, including non-technical areas. Program/project training and development expertise is considered essential in enabling the primary goal of this solicitation. It is also intended that this solicitation will extend learning by having the team members share their experiences both within, and outside of, their Center. Additional guidelines on training plan elements and best practices for HOPE Projects are provided in Appendix C, *Training Guidelines and Best Practices for HOPE Projects*.

**Requirement 2.** Proposals shall describe a training plan that addresses the training goal of this solicitation by defining the team personnel and organization and that shows that the maximum number of team personnel, including non-technical personnel (not just the Principal Investigator, Project Manager, and Project Systems Engineer) will benefit from the training opportunity because they are qualified to successfully execute the project but need additional experience to hone their expertise. As this is a training project, the team is expected to have an individual with training and development expertise as an active member of the project team. This plan shall list the early career hires and their mentors by name, describe the team members' and mentors' time commitment, and describe the mentorship

process proposed. Projects teams should strive to ensure project teams reflect the diversity of the NASA population.

**Requirement 3.** Proposals shall describe the Center's ongoing training program for project personnel and how the proposed HOPE project will combine with and enhance or complement these ongoing efforts. If Center, outside, or NASA Academy of Program Project and Engineering Leadership (APPEL) training courses are part of the project teams learning strategy they should also been identified and shown how they will be utilized to meet learning goals. APPEL Courses can be found at:  
<http://www.nasa.gov/offices/oce/appe/curriculum/index.html>

**Requirement 4.** Proposals shall describe how the project team members will share their learning experiences within, as well as outside of their Center. (After selection of the winning proposal, SMD, STP, and OCE/APPEL reserve the right to negotiate the methods for accomplishing this requirement in order to maximize the extension of the learning potential of the HOPE effort). Project teams will be responsible for providing an in-person briefing to SMD, STP, and OCE at Headquarters during the SMD Monthly Status Review at completion of the project.

See also Section 5.4.3 and Requirement 18.

## 5.2 Science/Technology Payload Requirements

The secondary goal of this solicitation is to fly a payload that will provide benefit to the SMD's overall science program, or fly a payload to mature or develop a space related technology having a useful purpose to either SMD or STP (see Section 2).

The payloads that will be proposed will contribute to SMD or STP's goals and objectives. For the purposes of this solicitation, the term payload is broadened to allow for advancing the development of capabilities in support of SMD science, or SMD or STP technology goals and objectives, *e.g.*, providing re-flights of instruments or components, demonstrating a proof of concept, providing flight calibration, or enabling technology readiness level (TRL) advancement of sensors or technologies for future use, or for advancing the readiness of selected space related technology systems.

**Requirement 5.** Proposals shall provide a payload that contributes to advancing either SMD science, or SMD or STP technology goals and objectives. Proposals shall state explicitly whether they are principally (i) science missions, (ii) technology missions, or (iii) mixed science *and* technology missions. Proposals shall also state the SMD science or SMD/STP technology goals that are being addressed, and proposals shall describe how the proposed mission and payload will contribute to advancing those goals and objectives.

The ability to determine whether a proposed project can successfully carry out the proposed hands-on flight project experience training and accomplish the science or technology payload objectives depends on a crisp, well-formulated articulation of the proposed objectives, the information and steps needed to bring closure to the objectives, and the measurements that must be obtained while conducting the mission.

**Requirement 6.** Proposals shall show the relationship between the science or technology objectives, mission to be flown, measurements to be obtained, and instrumentation to be used in obtaining the required data, at a level of detail sufficient to allow an assessment of the capability of the proposed mission to meet the original objectives. This requirement shall be met with an appropriate science and/or technology traceability matrix (see TABLE 1).

**Requirement 7.** Proposals shall include a plan to calibrate, analyze, and, if appropriate, publish and archive the data returned. If an appropriate NASA data archive does not exist, the data shall be made available to the public within a reasonable period of time.

Science Goals	Science Objectives	Scientific Measurement Requirements		Instrument Functional Requirements		Projected Performance	Mission Functional Requirements (Top Level)
		Observables	Physical parameters				
Goal 1	Objective 1	Absorption line	Column density of absorber	Alt. Range	XX km	ZZ km	Observing strategies: requires yaw and elevation maneuvers
Goal 2		Emission line	Density and temperature of emitter	Alt. Range	XX km	ZZ km	Launch window: to meet nadir and limb overlap requirement. Window applies day to day
Etc.			Size of features	Vert. Resol.	XX km	ZZ km	Need AA seasons to trace evolution of phenomena
		Morphological feature		Horiz. Resol.	XX deg x XX lat x XX long	ZZ deg x ZZ lat x ZZ long	
			Rise time of eruptive phenomenon	Temp. Resol.	XX min	ZZ min.	Need AA months of observation to observe variability of phenomena
				Precision	XX K	ZZ K	
	Objective 2 to N	Rate of change of observable phenomenon		Accuracy	XX K	ZZ K	
				Repeat above categories			

**TABLE 1: SCIENCE TRACEABILITY MATRIX (SAMPLE)**

## 5.3 Technical Requirements

### 5.3.1 Complete Flight System

The term “complete” encompasses both the payload element and the subsystems that support the payload in the accomplishment of its proposed mission as well as the carrier and its associated subsystems.

**Requirement 8.** Proposals shall describe the proposed complete flight system concept including the payload and its major subsystems, as well as the carrier and its associated subsystems. Proposals shall provide a Mission Traceability Matrix (see Table 2).

Mission Functional Requirements	Mission Design Requirements	Spacecraft Requirements	Ground System Requirements	Operations Requirements
From Table B1	Rocket type  Launch date:  Mission length  Orbit altitude requirement and rationale  Geographic coverage and how it drives orbit requirement  Orbit local time and rationale for the requirement  Type of orbit, e.g. Sun synchronous, precessing, Lagrangian point, other  Other	Spinning, stabilized  Mass  Power  Volume:  Data Rate  Temperature Range for spacecraft systems  Pointing Control: Knowledge, Stability, Jitter, Drift , Other  Detector radiation shielding requirements and rationale  Other	Passes per day and duration  Assumed antenna size  Data volume per day  Real time data transmission requirements  Transmit frequency  Power available for comm (Watts)  Downlink data rate  Number of data dumps per day  Spacecraft data destination (e.g., mission operations center)  Science data destination (e.g., science operations center)  Other	General spacecraft maneuver requirements and frequency  Special maneuvers requirements  Rationale for maneuvers  Ephemeris requirements  Changes in viewing modes and directions per orbit, per day or over longer time periods. Rationale for these changes  Other
Msn Functional Req or Instrument Accommodation (from Table B1)	Mission	Spacecraft	Ground System	Operations
Four different observing strategies: Solar, limb, nadir, zenith; requires yaw and elevation maneuvers		Agility requirements  Slew rate = $y$ deg/sec  Settle = stability < .001 deg/sec after 30 secs		Target planning on 3 day centers  Ephemeris accuracy of $x$ with updates every 2 days
Instrument X precision of 5K		Thermal stability of 1 deg/hr  S/C bus stability of .01 deg over 10 secs	Bit error rate < $1e-5$  Time correlation to 2 msec over 1 week	Weekly time correlation

**TABLE 2: MISSION TRACEABILITY MATRIX (SAMPLE)**

### 5.3.2 Mission Design and Operations

**Requirement 9.** Proposals submitted in response to this TO shall describe the proposed mission design concept for a suborbital rocket mission, balloon mission, CubeSat mission, suborbital reusable launch vehicle mission, or aircraft flight(s) (piloted, unmanned, or parabolic). The discussion shall include the launch/flight date, mission duration, trajectory, or mission track, as well as ground facilities and operations needed to conduct the mission, and the concept for conducting the mission.

### 5.3.3 Payload Interface

**Requirement 10.** Proposals submitted in response to this TO shall describe the proposed payload interface with the carrier including any required resources from its major subsystems.

### 5.3.4 Carrier Services

The suborbital-class carriers provided under HOPE, including examples of each carrier, the points of contact, associated carrier services, and weblinks are shown in Appendix A. Sounding Rockets can be procured through the Wallops Flight Facility (WFF) Sounding Rocket Program Office (SRPO). Balloons can be procured through the WFF Balloon Program Office. Aircraft can be procured or arranged through the Airborne Science Program. CubeSats can be supported through the WFF Small Satellite and Orbital Payloads Projects Office and the Human Exploration & Operations Mission Directorate (HEOMD) CubeSat Launch Initiative (CSLI) at NASA Headquarters. Parabolic aircraft flights and commercial suborbital reusable launch vehicles are provided through STP's Flight Opportunities Program.

The proposing Center is free to negotiate with any of these project offices or other carrier providers (including use of their own capabilities) to obtain the necessary capabilities and services.

The carrier services cost must be included as part of the proposed budget.

**Requirement 11.** All carrier and associated services costs and manpower shall be shown within the Total Project Cost.

**Requirement 12.** Proposals shall include mission requirements for the carrier and associated services.

### 5.3.5 Development Approach, Test and Verification

**Requirement 13.** Proposals submitted in response to this TO shall describe the proposed development approach, including payload and carrier, for implementing the project to meet the mission requirements within schedule and cost. In addition, the response shall also describe the approach to test and verification for both payload and carrier, including any critical facilities or tools needed to implement the project.

### 5.3.6 Schedule and Reviews

The selected project must be launch or flight-ready within 15 to 18 months from the selection date. The Center is free to determine the appropriate time for the project life cycle. There are

four reviews that are mandatory during the project life cycle. These are the System Requirements Review (SRR), the Preliminary Design Review (PDR), the Critical Design Review (CDR), and the Mission Readiness Review (MRR) or equivalent reviews that perform the same functions.

**Requirement 14.** The project shall propose the time appropriate for the project life cycle. If the schedule is not met, the project will not be penalized as long as the overall budget is not exceeded and the selected project is launch or flight-ready within the 18 month time period.

**Requirement 15.** Proposals shall identify appropriate reviews for the needs of the project. These reviews shall include at a minimum the SRR, PDR, CDR, and the MRR or equivalent reviews that perform the same functions. Proposals shall provide a complete project schedule including appropriate reviews.

## 5.4 Management Requirements

### 5.4.1 Project Management and Team Composition.

Project Teams are free to propose their own processes, procedures, and methods for managing their mission as long as they are consistent with the principles of NPR 7120.5E. It is a requirement for a training professional to be included as an active member of the HOPE project team.

**Requirement 16A.** The proposal shall define the roles and responsibilities of the team members appropriately for the needs of the project. It is a requirement for a training professional to be included as an active member of the HOPE project team. This includes the roles and responsibilities of the members of the carrier organization. All key team members and their mentors shall be identified by name and position. Team members not identified by name, or listed as TBD, will be marked down during the selection process.

### 5.4.2 Team Leader

The Project PI is accountable for the success of the science or technology payload with full responsibility for its integrity and mission success. Note that if the payload includes development of technical capabilities (Section 5.2), then scientific integrity includes the technology or technical integrity and success of the mission.

The Project Manager (PM) oversees the technical and programmatic (management, cost and schedule) implementation of the project.

Either the PI or the PM must be designated as the Team Leader. The Team Leader is responsible for the project's execution within committed cost and schedule. Regardless of which is designated the Team Leader, the PI and the PM must work closely together in order to ensure that the project meets its objectives within the resources outlined in the proposal.

**Requirement 16B.** The proposal shall clearly describe the proposed management organization, identifying the individuals by name and defining the respective roles and responsibilities of the team members, including at least the PI, PM, and Project Systems Engineer (PSE) and designating either the PI or PM as the Project Team Leader. This shall

also include the organization and roles and responsibilities of the members of the carrier organization.

#### 5.4.3 Project Team Qualifications and Responsibilities

The general qualifications of the PI, PM, PSE, and additional team members of the project team identified as beneficiaries of the training opportunity must be commensurate with the technical and managerial needs of the proposed project as well as the training needs as defined in Section 5.1.

**Requirement 17.** The Center must also show a commitment to the mentoring and support of the project team. A mentoring plan shall be included which lists the mentors by name, describes the mentoring engagement process, and the mentor's relevant experience and time commitment.

**Requirement 18.** Proposals shall identify which positions for the proposed Project Team are considered key project positions (as defined by the proposer) and which of these will be filled by early career NASA personnel team members targeted for hands-on training. Team members must be identified by name, and a mentor must be assigned to each early career NASA personnel team member.

**Requirement 19.** Proposals shall demonstrate for key project positions that the identified team members have the required technical background. Proposals shall demonstrate that the team members targeted for hands-on training have the appropriate experience and that they have served at lower professional levels so that their position on this project offers them a normal progression in their professional development.

The selected implementing Project Team has the responsibility to ensure that the mission meets performance, schedule, and cost constraints. It is the implementing Center's responsibility to provide the quality personnel and resources necessary to mentor, support, and guide the Project Team. It is a requirement for a training professional to be included as an active member of the HOPE project team. A training and development background is considered essential for the individual supporting the team's learning. The commitment and qualifications of the team and implementing Center will be assessed against the needs of the investigation.

**Requirement 20.** Proposals shall describe the qualifications and experience of the implementing Center and key project personnel. Proposals shall demonstrate the Center's commitment to provide oversight, mentor, support, develop, and guide the Project Team.

The implementing Center also has responsibility to demonstrate the need for the Project Team members in future Center activities and how the team members will fill those needs.

**Requirement 21.** Proposals shall describe how the project is aligned with the Center's succession planning strategy including how the project addresses the Center's needs for the trained personnel and how the knowledge gained will be integrated into the Center's overall training and development process. Proposals shall also provide a general reentry plan for the personnel showing how they will fill those needs.

#### 5.4.4 Risk Management

Proposers must demonstrate clear understanding of specific risks inherent in the development and implementation of their proposed project and must discuss their approaches to mitigating these risks. Examples of such risks that must be discussed in the proposal are: Project Team experience, any new technologies, or any nontrivial modifications or upgrades of existing technologies proposed for the payload; any manufacturing, test, or other facilities needed to ensure successful completion of the proposed project, including the payload and the carrier; any need for long-lead items that must be placed on contract before the CDR to ensure timely delivery; and any contributions that are critical to the success of the mission.

**Requirement 22.** The proposal shall define and discuss the major risks to the development and implementation of the proposed payload within proposed cost and schedule, including the management approaches to mitigate risk.

**Requirement 23.** If the proposed risk management approach includes potential descoping of project capabilities, the proposal shall include a discussion of the approach to such descopes, including the associated savings of resources (mass, power, dollars, schedule, *etc.*) and decision milestone(s).

#### 5.5 Cost Requirements

##### 5.5.1 Requested Funding and Total Project Cost

Cost policies, including the definitions of Requested Funding, Center Contributions, and Total Project Cost are given in Section 4.3.

**Requirement 24.** The proposal shall include the Total Project Cost and its components (proposed Requested Funding and proposed Center Contributions) in the required Cost Tables (see Section 6.2.1).

##### 5.5.2 Cost Estimating Methodologies and Reserve Management

Proposals may use cost estimates derived from appropriate methodologies including parametric cost models, cost estimating relationships, analogy, or grass roots (bottoms-up, WBS related) cost estimates.

**Requirement 25.** Proposals shall identify the methodologies used and rationale used to develop the proposed cost for the payload and the carrier services.

**Requirement 26.** Proposals shall identify sufficient margins in performance, schedule, and cost reserves in order to provide appropriate project reserves.

##### 5.5.3 Work Breakdown Structure (WBS)

**Requirement 27.** Proposals shall provide a WBS similar to that shown in Cost Table 1 and Cost Table 2 (see Section 6.2.1) but adapted to the carrier being used. Costs for most elements shall be specified to WBS Level-2. Exceptions are the costs of elements that explicitly appear only at a level below WBS Level-2 such as individual instruments or sensors.

#### 5.5.4 Equipment List

**Requirement 28.** Proposals shall include an Equipment List (EL) for the payload and carrier accommodation summarizing all the appropriate individual flight subsystems and instrument element components including mass, volume, power, and associated margins as well as level of development, heritage and source, in order to support validation of the proposed design and cost.

#### 5.5.5 Full Cost Accounting for NASA Facilities and Personnel

Proposal budgets are to include within the Total Project Cost, all costs that will be paid out of the project budget, including all Center and other contributions as well as civil servant labor. The Total Project Cost will also include the costs for contributions of test or other facilities. Proposal budgets do not need to be full cost; costs which are covered in other budgets (*e.g.*, CM&O) do not need to be included in the proposed budget.

**Requirement 29.** Proposals shall include all costs as appropriate and conform to the current NASA full cost policy for determining which costs are charged to projects.

#### 5.6 Contributions and Letters of Commitment

Contributions from sources other than the funds provided by SMD, STP, and OCE for this opportunity are welcome. These may include, but are not limited to, labor, services, and/or contributions to the payload including the use of existing hardware. For these contributions there must be accompanying Letters of Commitment signed by an institutional official from all organizations offering contributions of funds, goods, and/or services.

The required elements in an institutional Letter of Commitment for a contribution are: (i) a precise description of what is being contributed; (ii) a statement that the organization intends to provide the contribution or required funding for the project if it is selected; (iii) the strongest possible statement of financial commitment from the responsible organization to assure SMD/STP/OCE that all contributions will be provided as proposed; and (iv) a signature by an official authorized to commit the resource of the organization for participation in the payload.

**Requirement 30.** If a proposal includes contributions from Centers or other entities, the proposal shall identify the contributions, the source of the contributions and contain the appropriate Letters of Commitment from the contributing organization. Any associated costs for the contributions shall be clearly identified in the budget and counted toward the Total Project Cost.

#### 5.7 Additional Proposal Requirements

##### 5.7.1 Personnel Resumes

Because all proposals are from NASA Centers, no personal or institutional Letters of Commitment are required for Project Team members in the proposal. However, resumes from all the key Project Team personnel including the PI, PM, and other additional team members as defined by the proposer (including mentors) are required.

**Requirement 31.** Resumes for each of the key project team members and additional team members and the associated mentors (including the training and development lead) shall be provided in the proposal.

## **6. Proposal Submission Information**

### **6.1 Preproposal Activities**

#### **6.1.1 Question and Answer (Q&A) Telecon**

A Q&A Telecon will be held, in accordance with the schedule in Section 3. Further information, including logistics, will be transmitted prior to the Q&A Telecon to all designated Center POCs via email. Centers wishing to participate in the Telecon should provide a POC (for receipt of Telecon logistics information) to the Point of Contact at the address given in Section 6.1.3.

The purpose of this Telecon will be to address questions about the proposal process for this TO. Questions should be sent to the Point of Contact at the address given in Section 6.1.3. Questions may be addressed at the Telecon as time permits and as appropriate answers can be generated. Anonymity of the authors of all questions will be preserved. Presentations (if any) made at the Telecon, including answers to all questions addressed at the conference, will be emailed to the designated Project Team Leader (or POC) of each proposing team that submits an NOI. NOIs will be due on the date specified in Section 3. Additional questions and answers subsequent to the conference will be handled similarly, if necessary.

Q&A Telecon Information:  
Friday, December 7, 2012  
2-4 pm Eastern Time  
Dial-in line: 877-917-4413 passcode 4493367

#### **6.1.2 Notice of Intent to Propose**

To assist the planning of the proposal evaluation process and the dissemination of additional information concerning this TO, all prospective proposers are encouraged to submit a Notice of Intent (NOI) to propose before the NOI submittal deadline specified in Section 3. Material in a NOI is deemed confidential and will be used for planning purposes only. Those who submit NOIs will receive any TO updates or TO amendments that may occur, as well as copies of any Q&A (see Section 6.1.1).

NOI's are to be submitted in a short PDF document by email to the Point of Contact listed in Section 6.1.3 and will provide the following requested information to the extent that it is known by the NOI due date given in Section 3:

- (a) Name, address, telephone number, fax number, E-mail address, of the designated Center Point of Contact.
- (b) A list of the participating Centers and, to the extent known, the participating individuals including PI and PM.
- (c) A brief statement (250 words or less) for the following:
  - (i) science or technical objectives of the proposed mission;
  - (ii) identification of new technologies that may be employed as part of the mission;
  - (iii) relationship to other prior or planned projects.

(d) A summary of the anticipated launch/flight services to be used.

#### 6.1.3 Point of Contact

The Point of Contact (POC) for further information and inquiries about this TO is:

David Pierce  
Senior Program Executive for Suborbital Programs  
Science Mission Directorate  
National Aeronautics and Space Administration  
Washington, DC 20546-0001  
Telephone: (202) 358-3808  
E-mail: david.l.pierce@nasa.gov

NOIs and proposals should be emailed to the Point of Contact by the appropriate due date. The size of the PDF file should be limited such that it can be emailed (less than 20 MB). If there are any concerns about the sensitivity of the proposal or proprietary data, the NOI and/or the proposal can be submitted encrypted using ENTRUST.

#### 6.1.4 Lessons Learned

A list of Frequently Asked Questions, along with the answers, is provided in Appendix D. Lessons Learned from previously selected HOPE projects are available in the following articles from APPEL's ASK Magazine.

- *HOPE for the Future*: [http://askmagazine.nasa.gov/pdf/pdf36/NASA\\_APPEL\\_ASK\\_36s\\_hope\\_for\\_future.pdf](http://askmagazine.nasa.gov/pdf/pdf36/NASA_APPEL_ASK_36s_hope_for_future.pdf)
- *Reflecting on HOPE*: [http://www.nasa.gov/pdf/549358main\\_42s\\_reflecting\\_hope.pdf](http://www.nasa.gov/pdf/549358main_42s_reflecting_hope.pdf)

### 6.2 Proposal Preparation and Submission Requirements

#### 6.2.1 Structure of the Proposal

A uniform proposal format is required from all proposers to aid in proposal evaluation. The required proposal format and contents are summarized as below.

**Requirement 32.** Proposals shall conform to the uniform proposal format outlined below:

- (a) A proposal shall consist of a single PDF file with readily identifiable sections (bookmarked if possible) that correspond and conform to Sections A through I as shown in the Page Limit Table below. It shall be typewritten in English and shall employ metric (SI) and/or standard astronomical units, as applicable. Proposals for aircraft will use English measures regarding sensor integration. It shall contain all data and other information that will be necessary for scientific and technical evaluations; provision by reference to external sources, such as Internet websites, of additional material that is required for evaluation of the proposal is prohibited.
- (b) Page size shall be American standard 8.5 x 11 inches. Text shall not exceed 55 lines per page. Margins at the top, both sides, and bottom of each page shall be no less than 1 inch.

Single-column or double-column formats are acceptable for text pages. Type fonts for text and figure captions shall be no smaller than 12-point (*i.e.*, no more than 15 characters per inch; six characters per centimeter). There is no minimum requirement for fonts used within figures and tables but all text in figures and tables shall be legible; fonts smaller than 8-point are often illegible.

- (c) Proposals shall conform to a limit of 21 pages with up to a total of 8 extra pages for instruments and flight elements, and excluding table of contents, cost tables, and appendices.
- (d) Proposals exceeding the specified page number limits will not be rejected as they would in an AO, but will be downgraded. The following Page Limit Table provides guidance as to the suggested (but not required) length of the individual sections.

TABLE 4: PAGE LIMITS

Section	Page Limits
A. Cover Page and Abstract Combined	1
B. Table of Contents	No page limit
C. Hands-On Project Experience Personnel Training	4
D. Science/Technology and Implementation	4 + 2 pages per instrument*
E. Mission Implementation	3 + 2 pages per flight element*
F. Management	2 **
G. Cost and Cost Estimating Methodology	3
H. Schedule and accompanying narrative Cost Tables 1 and 2 (see below)	2 No page limit
I. Appendices: (no others permitted)	No page limit unless noted but brevity is encouraged.
• Letter(s) of Commitment	No limit
• Resumes	1 page / resume
• Equipment List (EL)	No limit
• Carrier Description	No limit
• Heritage	No limit
• List of Abbreviations and Acronyms	No limit
• References	No limit

The proposal may also contain three additional pages to be distributed among Sections C through I at the total discretion of the proposer.	3
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\*Total extra pages limited to 8

\*\*Schedule foldouts do not count against page limits

- (e) A project schedule covering all phases of the investigation shall be provided on a single page. The schedule format shall indicate the month and year of each milestone, have a corresponding table of dates, and follow a WBS similar to that shown in Cost Table 1 but adapted to the carrier being used, allowing WBS, schedule, and cost to flow in a traceable manner. The schedule and accompanying narrative shall address proposed major milestones including, at a minimum, the following items:
1. Subsystems development and major review dates;
  2. Instrument development and major review dates including instrument-to-subsystems/host integration and test;
  3. Ground systems development and major review dates (*e.g.*, mission operations and data analysis development schedule);
  4. Major deliverables (*e.g.*, ICDs, simulators, engineering modules, flight modules, *etc.*);
  5. Carrier integration and mission readiness;
  6. Project Reviews;
  7. Long-lead item specifications, development paths, and their impacts to schedule; and
  8. Schedule critical path identification; and funded schedule reserve, with indications of appropriate reserves associated with major milestones and deliverables.

**COST TABLE 1**  
**TOTAL PROJECT FUNDING PROFILE TEMPLATE**

WBS	WBS Element	FY 2012			FY 2013			Total Project		
		Requested Funding	Contributions	Total	Requested Funding	Contributions	Total	Requested Funding	Contributions	Total
01	Project Management									
02	Systems Engineering									
03	Safety & Mission Assurance									
04	Science / Technology									
05	Payload(s)									
	List each instrument separately									
06	Spacecraft									
	List each major flight system element separately									
07	Mission Operations									
08	Carrier / Services									
09	Ground System(s)									
10	Systems Integration & Testing									
11	Education & Public Outreach									
	Reserves									
	Total Requested Funding									
	Total Contributions									
	Total Project Cost									

**COST TABLE 2**  
**TOTAL PROJECT CIVIL SERVANT LABOR PROFILE TEMPLATE**

WBS	WBS Element	FY 2012			FY 2013			Total Project		
		Requested CS Labor	Contributed CS Labor	Total CS Labor	Requested CS Labor	Contributed CS Labor	Total CS Labor	Requested CS Labor	Contributed CS Labor	Total CS Labor
01	Project Management									
02	Systems Engineering									
03	Safety & Mission Assurance									
04	Science / Technology									
05	Payload(s)									
	List each instrument separately									
06	Spacecraft									
	List each major flight system element separately									
07	Mission Operations									
08	Carrier / Services									
09	Ground System(s)									
10	Systems Integration & Testing									
11	Education & Public Outreach									
	Reserves									
	Total Requested CS Labor									

	Total Contributed CS Labor									
	Total Project CS Labor									

## 6.2.2 Submission of Proposals

**Requirement 33.** A PDF version of the proposal shall be emailed to the POC at the address shown in Section 6.1.3 by the proposal submittal deadline specified in Section 3. The size of the PDF file should be limited (less than 20 MB) such that it can be emailed.

If there are any concerns about the sensitivity of the proposal or proprietary data, the NOI and/or the proposal can be submitted encrypted using ENTRUST. SMD/STP/OCE will notify proposers that their proposals have been received. Proposers who have not received this confirmation within one week after submittal of their proposals should contact the POC at the address given in Section 6.1.3.

## 7. Proposal Evaluation, Selection, and Implementation

### 7.1 Overview of the Proposal Evaluation and Selection Process

#### 7.1.1 Evaluation Process

Proposals will be evaluated by an internal NASA review panel, augmented as necessary by a few external reviewers, all of whom are peers of the proposers. The review will be conducted using the criteria specified in Section 7.2. Panel members will be instructed to evaluate every proposal independently without comparison to other proposals. This panel may be augmented through the solicitation of non-panel (mail-in) reviews, which the panel has the right to accept in whole or in part, or to reject.

The proposed project will be evaluated against the standard of providing the appropriate training experience for the team members while being able to successfully deliver the required science payload.

The carrier proposed is neither an evaluation factor nor a selection criterion.

Proposers should be aware that, during the evaluation and selection process, SMD/STP/OCE may request clarification of specific points in a proposal.

#### 7.1.2 Selection Process

After the evaluation by the review panel, the final evaluation results will be presented to the Associate Administrator for the Science Mission Directorate, (AA SMD) who will make the final selection. As the Selection Official, the AA SMD may consult with senior members of SMD, OCE, STP and the Agency concerning the selection. The AA SMD, as the Selection Official, has the right to consider the training needs of the individual Centers, as well as programmatic constraints. This decision will be coordinated with the Chief Engineer and the Director of STP.

## 7.2 Evaluation Criteria

### 7.2.1 Overview of Evaluation Criteria

The evaluation criteria, which will be used to evaluate proposals, are shown below. These criteria are defined more completely in the following sections.

- The merit of the proposed project for personnel development;
- The scientific and/or technology merit and feasibility of the proposed investigation; and
- The technical, management, and cost (TMC) feasibility of the proposed approach for mission implementation, including carrier compatibility.

For selection, all of the criteria will be equally weighted.

Evaluation findings for each evaluation criterion will be documented with narrative text in the form of specific major and minor strengths and weaknesses, as well as an adjectival summary score. The adjectival summary scores for the first two criteria (merit of the personnel training and scientific merit and feasibility) will be reported as Excellent, Selectable, or Not Recommended, as defined in the table below.

Summary Evaluation	Basis for Summary Evaluation
<u>Excellent</u> <u>Recommended</u>	A comprehensive, thorough, and compelling proposal of exceptional merit that fully responds to the objectives of the TO as documented by numerous and/or significant strengths and having no major weaknesses.
<u>Selectable</u>	A competent proposal that represents a credible response to the TO, having neither significant strengths nor weakness and/or whose strengths and weaknesses essentially balance.
<u>Not</u> <u>Recommended</u>	A seriously flawed proposal having one or more major weaknesses ( <i>e.g.</i> , an inadequate or flawed plan of research or lack of focus on the objectives of the TO).

The evaluations of personnel training and scientific merit and feasibility will be supported by identifying strengths and weaknesses of the individual proposals. These will be defined as follows.

- **Major Strength:** A facet of the response that is judged to be well above expectations and substantially contributes to the scientific merit or personnel training
- **Minor Strength:** A strength that substantiates the scientific merit or personnel training
- **Major Weakness:** A deficiency or set of deficiencies taken together that are judged to substantially detract from the scientific merit or personnel training

- **Minor Weakness:** A weakness that detracts from the scientific merit or personnel training

The third criterion, technical, management and cost feasibility, including carrier compatibility, will be reported as Low Risk, Medium Risk, or High Risk, as defined in the table below.

Summary Evaluation	Basis for Summary Evaluation
<u>Low Risk</u>	There are no problems evident in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the Proposer's capability to accomplish the investigation well within the available resources.
<u>Medium Risk</u>	Problems have been identified, but are considered within the Investigation Team's capabilities to correct within available resources with good management and application of effective engineering resources. Mission design may be complex and resources tight.
<u>High Risk</u>	One or more problems are of sufficient magnitude and complexity as to be deemed unsolvable within the available resources.

The TMC feasibility evaluations will be supported by identifying the strengths and weaknesses of the individual proposals. These will be defined as follows.

- **Major Strength:** A facet of the response that when judged, is found to be well above expectations
- **Minor Strength:** A strength that is substantial enough to be worthy of note and brought to the attention of proposers in debriefings, but is not a discriminator in the assessment
- **Major Weakness:** A facet of the response that when judged, is found to be well below expectations
- **Minor Weakness:** A weakness that is substantial enough to be worthy of note and brought to the attention of proposers in debriefings, but is not a discriminator in the assessment

#### 7.2.2 Merit of the Personnel Training Opportunity

The information provided in a proposal will be used to assess the degree to which the goal of providing hands-on flight systems development and flight experience that will enhance the technical, leadership, and project skills of the project team will be met.

- Factor A-1. Readiness of key individuals and additional team members. The factor includes the professional history of each of the key individuals and additional team members demonstrating that they have the proper technical background and capability

and that they are properly positioned to assume larger management or technical responsibilities.

- Factor A-2. Benefit to the key individuals and additional team members. This factor includes a demonstration of how each individual will benefit from participating in the project in the assigned position. This also includes the identification of the additional skills the individual should acquire and how the individual should grow as a result of the assignment.
- Factor A-3. Benefit to the Center. This factor includes a demonstration that the Center has a need for additional personnel to be trained in the positions proposed in the project and show how this training will support those needs in the future. It also includes how the project plans to extend the learning achieved by the project team.
- Factor A-4. Center support to the project team. This factor includes how well the Center will monitor, mentor, guide and/or maintain oversight of the project in order to support the team and assure the accomplishment of both the personnel experience and mission objectives.

#### 7.2.3 Scientific (or Technology) Merit and Feasibility of the Science (or Technology) Payload

The information provided in a proposal will be used to assess the intrinsic scientific/technologic merit and feasibility of the proposed payload. Note that, just as the science payload includes technology development and development of technical capabilities (Section 5.2), and scientific integrity includes the technological or technical integrity of the mission (Section 5.4.2), scientific merit and feasibility includes the technological or technical merit and feasibility of the proposed mission where the mission goals and objectives are technological or technical in nature. The factors for scientific/technologic merit and scientific/technologic feasibility include the following:

- Factor B-1. Scientific (or Technological) value and/or scientific (or Technological) utility of the proposed investigation's goals and objectives. This factor includes the clarity of the goals and objectives; how well the goals and objectives reflect SMD/OCT priorities; and the potential impact of the investigation on SMD science and/or SMD/OCT technology objectives.
- Factor B-2. Likelihood of scientific or technological success. This factor includes how well the anticipated scientific measurements or technology development support the goals and objectives, the appropriateness of the proposed investigation for addressing the goals and objectives, the appropriateness of the anticipated data to meet the goals and objectives, and the appropriateness of the mission requirements for guiding development and ensuring scientific success.
- Factor B-3. Probability of technical success. This factor includes the plan for technical readiness of the scientific or technology payload, the adequacy of the plan to develop the payload within the proposed cost and schedule, the recognition of risks and mitigation plans for retiring those risks, the ability of the development team - both institutions and individuals - to successfully implement those plans, and the likelihood of success for both the development and the operation of the payload within the mission design.

- Factor B-4. Probability of project team success. This factor will be evaluated by assessing the qualifications and organizational structure of the project team and the investigation/development design in light of proposed goals and objectives.

#### 7.2.4 TMC Feasibility, including Carrier Compatibility

The information provided in the proposal will be used to assess the technical, management, and cost risk. Specific factors include the following:

- Factor C-1. Adequacy and robustness of the technical plan. This factor includes assessment of implementation elements such as the overall project design and architecture including design margins; and the proposer's understanding of the processes, products, and activities required to accomplish development and integration of all project elements including the selected carrier.
- Factor C-2. Adequacy of the management approach including the capability of the management team and their approach to risk management. This factor includes the adequacy of the proposed organizational structure and management approach; the roles and qualifications of the PI, PM, PSE and implementing organization, including the project mentors, project management team; and the team's understanding of the scope of work covering all elements of the mission.
- Factor C-3. Adequacy and robustness of the cost plan and schedule. This factor includes assessment of proposal elements such as cost and cost risk, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks and reserves, and the team's understanding of the scope of work. This factor also includes an assessment of proposal elements to the project schedule, the project element interdependencies, the associated schedule margins, and an assessment of the likelihood of launching or initiating the mission by the proposed date.
- Factor C-4. The risk of flying the particular investigation on the selected carrier will be assessed. In particular, the compatibility of proposed investigation and carrier resources with those available and the appropriateness of the proposed interfaces will be judged for reasonableness and degree of difficulty for implementation.

### 7.3 Selection Factors

As described above in Section 7.2 the results of the proposal evaluations are based on the defined criteria being considered in the selection process.

The overriding consideration for the final selection of proposals submitted in response to this TO will be to provide a hands-on training experience to any selected NASA Center in-house project team while advancing NASA's science and technology goals and objectives within the available budget and schedule for this project.

### 7.4 Implementation of Selected Proposals

#### 7.4.1 Notification of Selection

Following selection, the Project Team Leader for the selected proposal (see Requirement 16B) will be notified by telephone, followed by formal written notification which may include any

special conditions or terms of the offer of selection. The formal notification will also include instructions for scheduling a debriefing at which any issues noted during the evaluation that may require attention will be discussed, as well as instructions for attending the Project Initiation Conference via videoconference.

#### 7.4.2 Project Oversight Management

Oversight management responsibilities for project implementation have been assigned to the Earth Science system Pathfinder (ESSP) Program Office at the Langley Research Center. This responsibility will be carried out in large part by the use of a Standing Review Board which will in general be responsible for the conduct of the SRR, PDR, CDR, and MRR (or equivalent). However, the ESSP and selected project will work together to agree on the most appropriate review process after project selection.

#### 7.4.3 Approval of the Project Plan

The Project Plan will be completed prior to PDR and submitted for approval at PDR.

#### 7.4.4 Opportunity for Debriefing of Nonselected Proposers

Proposers of all investigations not selected will be notified and offered debriefings by telephone in order to help prepare the teams for subsequent proposal opportunities.

### 8. Conclusion

This HOPE training opportunity represents an innovative way for SMD/STP/OCE to advance science goals and objectives while providing flight opportunity experience to enhance the technical, leadership, and project experience for NASA Center in-house personnel. SMD/STP/OCE invites all NASA Centers to propose in response to this Training Opportunity.



John Grunsfeld  
Associate Administrator  
Science Mission Directorate



Michael Gazarik  
Director, Space Technology Program



Michael Ryschkewitsch  
NASA Chief Engineer

## Appendix A

### Summary of Requirements

Requirement	Description
1	<b>Submittal Due Date (sect. 3):</b> Proposals submitted in response to this solicitation shall be delivered no later than the associated deadline and shall be delivered to the Address for Submittal of Proposals given in Section 6.1.3.
2	<b>Training Plan (sect. 5.1):</b> Proposals shall describe a training plan that addresses the training goal of this solicitation by defining the team personnel and organization and that shows that the maximum number of team personnel, including non-technical personnel (not just the Principal Investigator, Project Manager, and Project Systems Engineer) will benefit from the training opportunity because they are qualified to successfully execute the project but need additional experience to hone their expertise. As this is a training project, the team is expected to have an individual with training and development expertise as an active member of the project team. This plan shall list the early career hires and their mentors by name, describe the team members' and mentors' time commitment, and describe the mentorship process proposed. Projects teams should strive to ensure project teams reflect the diversity of the NASA population.
3	<b>Training (sect. 5.1):</b> Proposals shall describe the Center's ongoing training program for project personnel and how the proposed HOPE project will combine with and enhance or complement these ongoing efforts. If Center, outside, or NASA Academy of Program Project and Engineering Leadership (APPEL) training courses are part of the project teams learning strategy they should also been identified and shown how they will be utilized to meet learning goals. APPEL Courses can be found at: <a href="http://www.nasa.gov/offices/oce/appel/curriculum/index.html">http://www.nasa.gov/offices/oce/appel/curriculum/index.html</a>
4	<b>Lessons Learned/Knowledge Sharing (sect. 5.1):</b> Proposals shall describe how the project team members will share their learning experiences within, as well as, outside of their Center. (After selection of the winning proposal, SMD, STP, and OCE/APPEL reserve the right to negotiate the methods for accomplishing this requirement in order to maximize the extension of the learning potential of the HOPE effort). Project teams will be responsible for providing an in-person briefing to SMD, STP, and OCE at Headquarters during the SMD Monthly Status Review at completion of the project.

5	<b>Payload Requirements (sect. 5.2):</b> Proposals shall provide a payload that contributes to advancing either SMD science, or SMD or STP technology goals and objectives. Proposals shall state explicitly whether they are principally (i) science missions, (ii) technology missions, or (iii) mixed science <i>and</i> technology missions. Proposals shall also state the SMD science or SMD/STP technology goals that are being addressed, and proposals shall describe how the proposed mission and payload will contribute to advancing those goals and objectives.
6	<b>Payload Traceability (sect. 5.2):</b> Proposals shall show the relationship between the science or technology objectives, mission to be flown, measurements to be obtained, and instrumentation to be used in obtaining the required data, at a level of detail sufficient to allow an assessment of the capability of the proposed mission to meet the original objectives. This requirement shall be met with an appropriate science and/or technology traceability matrix (see TABLE 1).
7	<b>Data (sect. 5.2):</b> Proposals shall include a plan to calibrate, analyze, and, if appropriate, publish and archive the data returned. If an appropriate NASA data archive does not exist, the data shall be made available to the public within a reasonable period of time.
8	<b>Flight System (sect. 5.3.1):</b> Proposals shall describe the proposed complete flight system concept including the payload and its major subsystems, as well as the carrier and its associated subsystems. Proposals shall provide a Mission Traceability Matrix (see Table 2).
9	<b>Mission Design (sect. 5.3.2):</b> Proposals submitted in response to this TO shall describe the proposed mission design concept for a suborbital rocket mission, balloon mission, CubeSat mission, suborbital reusable launch vehicle mission, or aircraft flight(s) (piloted, unmanned, or parabolic). The discussion shall include the launch/flight date, mission duration, trajectory, or mission track, as well as ground facilities and operations needed to conduct the mission, and the concept for conducting the mission.
10	<b>Payload Interface (sect. 5.3.3):</b> Proposals submitted in response to this TO shall describe the proposed payload interface with the carrier including any required resources from its major subsystems (see Appendix A).
11	<b>Carrier Cost (sect. 5.3.4):</b> All carrier and associated services costs and manpower shall be shown within the Total Project Cost.
12	<b>Carrier Requirements (sect. 5.3.4):</b> Proposals shall include mission requirements for the carrier and associated services.
13	<b>Development Approach (sect. 5.3.5):</b> Proposals submitted in response to this TO shall describe the proposed development approach, including payload and carrier, for implementing the project to meet the mission requirements within schedule and cost. In addition, the response shall also describe the approach to test and verification for both payload and carrier, including any critical facilities or tools needed to implement the project.

14	<b>Schedule (sect. 5.3.6):</b> The project shall propose the time appropriate for the project life cycle. If the schedule is not met, the project will not be penalized as long as the overall budget is not exceeded and the selected project is launch or flight-ready within the 18 month time period.
15	<b>Reviews (sect. 5.3.6):</b> Proposals shall identify appropriate reviews for the needs of the project. These reviews shall include at a minimum the SRR, PDR, CDR, and the MRR or equivalent reviews that perform the same functions. Proposals shall provide a complete project schedule including appropriate reviews.
16A	<b>Roles and Responsibilities (sect. 5.4.1):</b> The proposal shall define the roles and responsibilities of the team members appropriately for the needs of the project. It is a requirement for a training professional to be included as an active member of the HOPE project team. This includes the roles and responsibilities of the members of the carrier organization. All key team members and their mentors shall be identified by name and position. Team members not identified by name, or listed as TBD, will be marked down during the selection process.
16B	<b>Management Organization (sect. 5.4.2):</b> The proposal shall clearly describe the proposed management organization, identifying the individuals by name and defining the respective roles and responsibilities of the team members, including at least the PI, PM, and Project Systems Engineer (PSE) and designating either the PI or PM as the Project Team Leader. This shall also include the organization and roles and responsibilities of the members of the carrier organization.
17	<b>Mentoring (sect. 5.4.3):</b> The Center must also show a commitment to the mentoring and support of the project team. A mentoring plan shall be included which lists the mentors by name, describes the mentoring engagement process, and the mentor's relevant experience and time commitment.
18	<b>Team Positions (sect. 5.4.3):</b> Proposals shall identify which positions for the proposed Project Team are considered key project positions (as defined by the proposer) and which of these will be filled by early career NASA personnel team members targeted for hands-on training. Team members must be identified by name, and a mentor must be assigned to each early career NASA personnel team member.
19	<b>Team Qualifications (sect. 5.4.3):</b> Proposals shall demonstrate for key project positions that the identified team members have the required technical background. Proposals shall demonstrate that the team members targeted for hands-on training have the appropriate experience and that they have served at lower professional levels so that their position on this project offers them a normal progression in their professional development.

20	<b>Center Qualifications (sect. 5.4.3):</b> Proposals shall describe the qualifications and experience of the implementing Center and key project personnel. Proposals shall demonstrate the Center's commitment to provide oversight, mentor, support, develop, and guide the Project Team.
21	<b>Project-Center Alignment (sect. 5.4.3):</b> Proposals shall describe how the project is aligned with the Center's succession planning strategy including how the project addresses the Center's needs for the trained personnel and how the knowledge gained will be integrated into the Center's overall training and development process. Proposals shall also provide a general reentry plan for the personnel showing how they will fill those needs.
22	<b>Risk Management (sect. 5.4.4):</b> The proposal shall define and discuss the major risks to the development and implementation of the proposed payload within proposed cost and schedule, including the management approaches to mitigate risk.
23	<b>Descopel Plan (sect. 5.4.4):</b> If the proposed risk management approach includes potential descoping of project capabilities, the proposal shall include a discussion of the approach to such descopes, including the associated savings of resources (mass, power, dollars, schedule, etc.) and decision milestone(s).
24	<b>Cost (sect. 5.5.1):</b> The proposal shall include the Total Project Cost and its components (proposed Requested Funding and proposed Center Contributions), in the required Cost Tables (see Section 6.2.1).
25	<b>Cost (sect. 5.5.2):</b> Proposals shall identify the methodologies used and rationale used to develop the proposed cost for the payload and the carrier services.
26	<b>Margins/Reserves (sect. 5.5.2):</b> Proposals shall identify sufficient margins in performance, schedule, and cost reserves in order to provide appropriate project reserves.
27	<b>WBS (sect. 5.5.3):</b> Proposals shall provide a WBS similar to that shown in Cost Table 1 and Cost Table 2 (see Section 6.2.1) but adapted to the carrier being used. Costs for most elements shall be specified to WBS Level-2. Exceptions are the costs of elements that explicitly appear only at a level below WBS Level-2 such as individual instruments or sensors.
28	<b>Equipment List (sect. 5.5.4):</b> Proposals shall include an Equipment List (EL) for the payload and carrier accommodation summarizing all the appropriate individual flight subsystems and instrument element components including mass, volume, power, and associated margins as well as level of development, heritage and source, in order to support validation of the proposed design and cost.
29	<b>Cost (sect. 5.5.5):</b> Proposals shall include all costs as appropriate and conform to the current NASA full cost policy for determining which costs are charged to projects.

30	<b>Letters of Commitment (sect. 5.6):</b> If a proposal includes contributions from Centers or other entities, the proposal shall identify the contributions, the source of the contributions and contain the appropriate Letters of Commitment from the contributing organization. Any associated costs for the contributions shall be clearly identified in the budget and counted toward the Total Project Cost.
31	<b>Resumes (sect. 5.7.1):</b> Resumes for each of the key project team members and additional team members and the associated mentors (including the training and development lead) shall be provided in the proposal.
32	<b>Proposal Format (sect. 6.2.1):</b> Proposals shall conform to the uniform proposal format.
33	<b>Proposal Submission (sect. 6.2.2):</b> A PDF version of the proposal shall be emailed to the POC at the address shown in Section 6.1.3 by the proposal submittal deadline specified in Section 3. The size of the PDF file should be limited such that it can be emailed.

## **Appendix-B**

### **Suborbital Platform Capabilities**

#### **NASA Airborne Science Program**

##### Points of Contact:

Bruce Tagg  
Earth Science Division  
Science Mission Directorate  
National Aeronautics and Space Administration  
Washington, DC 20546-0001  
Telephone: (202) 358-2890  
E-mail: [Bruce.A.Tagg@nasa.gov](mailto:Bruce.A.Tagg@nasa.gov)

Randy Albertson  
Earth Science Division  
Science Mission Directorate  
National Aeronautics and Space Administration  
Washington, DC 20546-0001  
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Within the NASA Science Mission Directorate, the Earth Science Division's Airborne Science Program (ASP) manages and operates unique, modified aircraft that support NASA satellite missions, related scientific experiments, as well as providing platforms for airborne/space borne instrument development. The Program maintains a core asset pool consisting of the DC-8, ER-2, G-III, and P-3B, as well as a range of other NASA-owned and leased aircraft, and provides a gateway to researchers for the use of other aircraft.

For HOPE, ASP will provide project assistance with platform identification, mission and flight planning to support the science/technology investigation, integration and engineering (including Experimenter Handbooks and electronic data) as needed to integrate and fly the payloads/instruments, as well as assistance with all aspects of the flight program.

Airborne mission support costs vary widely dependent upon aircraft, operations location, mission unique support, and contractor support required. The proposing team must pay for: aircraft flight costs, subsystems, expendables, mission unique engineering, fabrication, travel, and logistics. Requestors are encouraged to contact the listed Airborne Science Program Points of Contact directly to identify mission specific services and develop aircraft mission estimates costs.

The full suite of ASP assets, processes, and procedures can be found at  
<http://airbornescience.nasa.gov>.  
<http://airbornescience.nasa.gov/sofrs/>.

## **NASA Balloon Program Office**

### Points of Contact:

Debora Fairbrother  
Balloon Program Office  
Suborbital and Special Orbital Projects Directorate  
Goddard Space Flight Center/Wallops Flight Facility  
National Aeronautics and Space Administration  
Wallops Island, VA 23337  
Telephone: (757) 824-1717  
E-mail: [Debora.A.Fairbrother@nasa.gov](mailto:Debora.A.Fairbrother@nasa.gov)

Gabe Garde  
Balloon Program Office  
Suborbital and Special Orbital Projects Directorate  
Goddard Space Flight Center/Wallops Flight Facility  
National Aeronautics and Space Administration  
Wallops Island, VA 23337  
Telephone: (757) 824-2598  
E-mail: [Gabriel.J.Garde@nasa.gov](mailto:Gabriel.J.Garde@nasa.gov)

Within the NASA/GSFC/WFF's Suborbital and Special Orbital Projects Directorate, the Balloon Program Office (BPO) manages the scientific balloon program, including balloon launch operations conducted by the Columbia Scientific Balloon Facility (CSBF). The Balloon Program offers a wide range of standard balloon platforms and support systems to meet user requirements.

For HOPE, projects are eligible to be launched on a NASA standard design, zero-pressure balloon from the NASA remote site at Fort Sumner, New Mexico. Projects may also be launched from Palestine, Texas, dependent upon meeting the prescribed NASA Flight Safety criteria.

Due to numerous payload configurations and variable engineering efforts, proposal teams must contact the Balloon Program Office Points of Contact to identify mission requirements. Balloon mission support costs vary depending upon vehicle, flight support systems, and launch location. In general, BPO will cover standard/nominal support services, including payload integration with standard CSBF support systems, payload testing prior to launch, launch, flight operations, and payload/data recovery. The HOPE team must pay for: launch (balloon and expendables), any mission unique engineering, fabrication, travel, and logistics. Requestors are encouraged to contact the BPO Points of Contact directly to identify mission specific services and develop mission estimates costs.

The full suite of BPO assets, processes, and procedures is available on-line at:

<http://www.csbf.nasa.gov/>  
<http://sites.wff.nasa.gov/code820/>

## **NASA CubeSats**

### Points of Contact:

Scott Schaire  
Small Satellite and Orbital Payloads Projects Office  
Suborbital and Special Orbital Projects Directorate  
Goddard Space Flight Center/Wallops Flight Facility  
National Aeronautics and Space Administration  
Wallops Island, VA 23337  
Telephone: (757) 824-1120  
E-mail: [Scott.H.Schaire@nasa.gov](mailto:Scott.H.Schaire@nasa.gov)

Garrett Skrobot  
Educational Launch of Nanosatellite (ElaNa) Project  
Launch Services Program  
Kennedy Space Center  
National Aeronautics and Space Administration  
Kennedy Space Center, FL 32899  
Telephone: (321) 867-5365  
E-mail: [Garrett.L.Skrobot@nasa.gov](mailto:Garrett.L.Skrobot@nasa.gov)

A CubeSat is a type of space research nanosatellite. The base CubeSat dimension is 10x10x11 centimeters (one “Cube” or “1U”). CubeSats typically range in size from one to six Cubes (10x20x34 centimeters) in volume and typically weigh no more than one kilogram per 1U Cube.

Through HOPE, NASA (SMD, OCE, and STP) evaluates the merit and feasibility of the proposed CubeSat investigation. Selected missions are funded to build the CubeSat. For technical information regarding available CubeSat bus systems and components, please contact Mr. Scott Schaire, Project Manager, Small Satellite and Orbital Payloads Projects Office.

Concurrent with the HOPE TO, NASA (HEOMD) solicits CubeSat proposals annually as part of the CubeSat Launch Initiative (CSLI). Through CSLI, NASA competitively selects CubeSats for manifesting as a secondary payload on a NASA or DoD launch. For information regarding flight opportunities for CubeSats, including CSLI, please contact Mr. Garrett Skrobot, Launch Services Mission Manager, Educational Launch of Nanosatellite (ElaNa) Project, at Kennedy Space Center.

More information about the CubeSat Launch Initiative, including previously-selected Respondents, is available at:  
[http://www.nasa.gov/directorates/heo/home/CubeSats\\_initiative.html](http://www.nasa.gov/directorates/heo/home/CubeSats_initiative.html).

## **NASA's Flight Opportunities Program**

### Points of Contact:

LK Kubendran  
Program Executive  
National Aeronautics and Space Administration  
Washington, DC 20546-0001  
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John Kelly  
Program Manager  
Dryden Flight Research Center  
National Aeronautics and Space Administration  
Edwards, CA 93523-0273  
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The NASA Flight Opportunities Program (FOP) is one of the nine programs within the newly established Space Technology Program. The Space Technology Program serves as the Agency's technology development and demonstration engine, working with industry, academia, other government agencies and international partners to conceptualize, develop, build, test and demonstrate key space capabilities that work toward flight readiness status by testing in space-relevant environments.

The Flight Opportunities Program offers flights for HOPE utilizing a suite of seven commercial companies to integrate and fly payloads on suborbital reusable platforms near the boundary of space. The FOP offers a range of commercial suborbital platforms.

Proposal teams are encouraged to contact the NASA Flight Opportunities Program Points of Contact to identify mission requirements.

The list of FOP provided commercial companies, the vehicles offered, summaries of their capabilities, as well as the processes, and procedures to arrange for flight may be found at: <https://flightopportunities.nasa.gov/platforms>.

## **NASA Sounding Rockets Program Office**

### Points of Contact:

Philip Eberspeaker  
Sounding Rockets Program Office  
Suborbital and Special Orbital Projects Directorate  
Goddard Space Flight Center/Wallops Flight Facility  
National Aeronautics and Space Administration  
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Libby West  
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The Sounding Rockets Program Office (SRPO) can provide a wide variety of support to assist HOPE teams in developing their sounding rocket payload and mission design. This support can include payload design, standardized support subsystems (telemetry, attitude control, recovery, deployment mechanisms, fabrication services, etc.), and environmental testing services. It is also possible for the HOPE teams to perform all development, fabrication, and testing in-house at their own facility and arrive at the launch site “flight ready” as long as all flight worthiness and safety criteria are satisfied. Due to variable payload configurations and engineering efforts, proposers must contact the SRPO for pre-proposal discussions to identify mission requirements, services and to develop mission cost estimates.

The Sounding Rocket Users Handbook (<http://sites.wff.nasa.gov/code810/files/SRHB.pdf>) offers detailed information on the sounding rocket mission process, subsystem capabilities, and testing protocol and serves as a starting point for proposal teams interested in conducting a sounding rocket mission.

The SRPO typically uses a longeron and deck design philosophy, but other configurations can be employed. The SRPO can supply payload support systems such as telemetry, attitude control, and recovery. Specially designed and mission unique systems can also be provided by SRPO on a cost reimbursable basis, paid for by the HOPE project team.

The Terrier-Improved Orion is offered as the baseline launch vehicle for HOPE. The payload is typically 14.0” in diameter outer-diameter, but can be expanded to 17.26” diameter if necessary. In general, the Terrier-Improved Orion launch vehicle is capable of lofting a 250 kg (550 lb)

payload to an altitude of approximately 200 km. This provides nearly 300 seconds of flight time above 100 km. The baseline launch vehicle cost is \$100K.

The most economical launch site for HOPE missions is Wallops Flight Facility (WFF), due to core range funding. In general, only non-core costs such as range surveillance will be charged to the project. In general, the HOPE project will be charged approximately \$20K per day to cover costs associated with consumables and range safety surveillance. The actual cost will depend on the complexity of the mission. White Sands Missile Range (WSMR) and Poker Flat, Alaska launch operations are an option, however, HOPE projects must pay for the associated non-core costs. For example, non-core costs for a WSMR operation will include project team travel and the \$150K (per launch attempt) Army range costs. Basic recovery costs will be covered by the SRPO, but any costs associated with advanced operations (i.e. multiple helicopters) must be covered by the HOPE project. Poker operations will only be conducted in the January and February time frame (typical auroral season). Costs will be minimized if the HOPE project is conducted during an existing Poker operation. In the event that there is no core Poker operation, the HOPE project will be required to cover certain range, logistics, and travel costs.

Environmental support services can be provided by the SRPO at nominal cost. It is anticipated that these services will be economical as long as standard sounding rocket practices and testing protocols are followed. Payload integration and environmental testing typically takes two weeks to complete. Projects utilizing SRPO subsystems must be integrated and testing at Wallops Flight Facility. Payloads that do not utilize SRPO subsystems may be integrated and tested elsewhere, but all standard sounding rocket testing protocols must be followed to ensure there will be no catastrophic failures that will cause a public safety risk (i.e. internal structural failure that results in severe imbalance).

The SRPO will cover costs associated with general project consultation and standard sounding rocket project reviews (Mission Initiation Conference, Requirements Definition Meeting, Design Review, and Mission Readiness Review). Costs associated with offsite meetings and reviews, and reviews that go beyond the standard sounding rocket reviews must be covered by the HOPE project.

Information on the Sounding Rockets Program provided services, the vehicles offered, summaries of their capabilities, as well as the processes, and procedures to arrange for flight may be found at:

<http://sites.wff.nasa.gov/code810/>

<http://sites.wff.nasa.gov/code810/process.html>

[http://sites.wff.nasa.gov/code810/download\\_archive.html](http://sites.wff.nasa.gov/code810/download_archive.html)

## **Appendix-C**

### **Training Guidelines and Best Practices for HOPE Projects**

#### **Example outline of the HOPE Training Plan**

- Project Organizational Roles and Responsibilities
- Role of Training Team Member in Project Team
- Team Member Evaluation, Individual Development Plans and Team Skill Assessments
- Center Skill alignment, skill tracking, and succession planning, re-integration activities
- Center Training Program and alignment to project
- Career Counseling, Coaching and Mentoring
- Training Opportunities, APPEL, Formal and Informal Training
- Knowledge Sharing and Lessons Learned

#### **Essential Training Elements for HOPE Projects**

- Training Courses
- Team Member Experience
- Training Expert as Team Member
- Mentoring
- Measurement Strategy and Reentry Needs
- Lessons Learned/Knowledge Sharing

#### **Training Courses**

<b>Minimal</b>	Project team attending training offerings
<b>Good</b>	Training offerings targeted and scheduled to meet HOPE Project team needs
<b>Better</b>	Training expert identifies and schedules just-in-time, phase specific training for HOPE project team members
<b>Best</b>	Training expert works with team members to identify learning gaps and works with trainers to redesign their courses to meet phase specific, just-in-time team member's learning needs

#### **Team Members Experience**

<b>Minimal</b>	Team member who has had some exposure to role assigned in HOPE
<b>Good</b>	Stretch assignment for team member who has had some experience in supporting the role assigned in HOPE
<b>Better</b>	Stretch assignment with evidence of direct exposure to duties in the role assigned in HOPE at next lowest level of complexity

<b>Best</b>	Stretch assignment with evidence of some past experience serving in the role assigned (or as deputy) in HOPE at next lowest level of complexity
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### **Training Expert as Team Member**

<b>Minimal</b>	Program manager or engineer as learning lead contacts training office with needs
<b>Good</b>	Program manager or engineer as learning lead contacts training office with identified needs based on skill/knowledge gap analysis
<b>Better</b>	Training expert as project team member who consults with the project member on identifying learning gaps and sources to meet training needs
<b>Best</b>	Training expert as project team member who is actively involved in all aspects of the project, continually monitoring and identifying needs and sources to meet training needs, and coaches team members and mentors, establishes individual, phase specific learning needs for each team member

### **Mentoring**

<b>Minimal</b>	Experienced mentors with relevant experience
<b>Good</b>	Experienced mentors with relevant experience and a defined mentoring plan that includes regular and frequent meetings with their assigned mentee
<b>Better</b>	Experienced mentors with relevant experience, a defined mentoring plan that includes regular and frequent meetings with their assigned mentee, including preparing for reviews, and mentor involvement in identifying mentee learning needs/gaps
<b>Best</b>	Experienced mentors with relevant experience, a defined mentoring plan for each early career hire team member that includes regular and frequent meetings with their mentee including preparing for reviews, mentor involvement in identifying mentee learning needs/gaps, and includes a way to advance the mentee's skills

### **Measurement Strategy and Reentry Needs**

<b>Minimal</b>	Includes pre and post measurement of team members learning goals
<b>Good</b>	Includes pre and post measurement of team member's learning goals, addresses alignment with Center needs, and establishes a re-entry plan based on knowledge gained from experience
<b>Better</b>	Includes pre and post measurement of team member's

	learning goals, addresses alignment with Center needs and alignment with succession planning strategy, and establishes a re-entry plan based on knowledge gained from experience
<b>Best</b>	Includes pre and post measurement of team member's learning goals, addresses alignment with Center needs and succession planning strategy, and establishes a re-entry plan based on knowledge gained from experience

### **Lessons Learned/Knowledge Sharing**

<b>Minimal</b>	Within the team
<b>Good</b>	Within the center
<b>Better</b>	Within NASA
<b>Best</b>	Inside and outside NASA

### **Complexity and Communication**

<b>Minimal</b>	Entire team within one Center
<b>Good</b>	Multi-Center project with one Center having all key roles and cross-center communication addressed
<b>Better</b>	Multi-Center project with key roles shared between participating centers and includes a strategic communications plan for team members
<b>Best</b>	Multi-Center project with key roles shared between participating centers and any outside organizations with strategic communication plan for all team members, stakeholders and mentors

## Appendix D

### Frequently Asked Questions

- Q1. How should margin be calculated for performance, cost, and schedule parameters?  
 A1. The definition that is found in the Standard SMD AO should be used.

**Definitions:**

Contingency, when added to the current estimate for a resource, results in the maximum expected value for that resource. Percent contingency is the value of the contingency divided by the value of the resource less the contingency.

Margin is the difference between the maximum possible capability of a resource (the physical limit or the agreed-to limit) and the maximum expected value for a resource. Percent margin for a resource is the available margin divided by its maximum expected value.

Example: A payload in the design phase has a maximum expected mass of 115 kg including a mass contingency of 15 kg. There is no other payload on the ELV and the ELV provider plans to allot the payload the full capability of the vehicle, if needed. The ELV capability is 200 kg. The mass contingency is  $15/100 = 15\%$  and the mass margin is 85 kg or  $85/115 = 74\%$ .

Example: The end-of-life (EOL) capability of a spacecraft power system is 200 Watts, of which 75 Watts has been allocated to the instrument and 100 Watts has been allocated to the spacecraft bus. The power margin is the unallocated 25 Watts or  $25/175 = 14.3\%$ . The current best estimate for the instrument power is 60 Watts, leaving 15 Watts or  $15/60 = 25\%$  contingency to the 75 Watt maximum expected value.

Acknowledging that the maximum expected resource value is equal to the maximum proposed resource value (including contingency), the above technical terms can be expressed in equation form as:

Contingency = Max Expected Resource Value – current estimate of Resource Value

% Contingency =  $\frac{\text{Contingency}}{\text{Max Expected Resource Value} - \text{Contingency}} \times 100$

Margin = Max Possible Resource Value – Max Expected Resource Value

% Margin =  $\frac{\text{Margin}}{\text{Max Expected Resource Value}} \times 100$

- Q2. Would it be okay to use all the HOPE funding for procurement and none of it for salary?  
 A2. Yes. Note that there is a maximum of \$800K available for procurement.
- Q3. Would it be okay to procure the flight opportunity for a CubeSat other than through one of the NASA programs listed in the appendix?  
 A3. Yes.

- Q4. Section 4.2.3 of the HOPE call states: "Each Center is allowed to select and submit one training proposal composed of personnel from that Center. One additional proposal will be allowed if the second proposal is composed of a team that has participation from multiple Centers (at least one additional Center)." Does this mean that a Center may only *participate* in two proposals (if one involves another Center), or rather that a Center may only *submit* two proposals (if one involves another Center), meaning that the Center could potentially be involved in a third proposal which another Center submits?
- A4. The latter – only submit 2. That is to limit the work in writing proposals since we will only select 1 (maybe 2) no matter how many are written. But no limit in the number you may participate in as that does not increase the number of proposals.
- Q5. Regarding CubeSats, the HOPE announcement indicates that the missions need to be launched or flight ready within 15-18 months, which gives one the opportunity to complete the flight readiness of a CubeSat within the schedule constraints and “store” the unit for a predetermined launch opportunity. Since the HOPE TO does not provide the launch opportunity for cubesats, can you elaborate on the expectations for CubeSat proposals to HOPE, specifically the expectations for identifying the flight opportunity and whether a letter of commitment required for launch service for the CubeSats?
- A5. We expect the proposing team to provide the information and documentation in the proposal that they think is required to convince us that the proposed project is both feasible and meritorious when evaluated against the criteria in the HOPE solicitation. That being said, it seems reasonable that teams proposing CubeSats should provide a letter of commitment from the launch services provider, including a commitment to manifest the CubeSat, and specifying the expected launch opportunity. In the case that the launch is outside the 18 month window, the team should present its plan for maintaining the payload and team until the launch occurs. More information about the CubeSat Launch Initiative, including previously-selected Respondents, is available at: [http://www.nasa.gov/directorates/heo/home/CubeSats\\_initiative.html](http://www.nasa.gov/directorates/heo/home/CubeSats_initiative.html).
- Q.6 What is the timeline for reviews - following the January submission?
- A.6 SMD/STP/OCE are planning to make selections by the end of March.
- Q.7 Can on-site contractors participate in this program (using procurement dollars) or is it limited to civil servants?
- A.7 Prospective project teams can be composed only of in-house NASA Center (NASA badged) personnel. The team can be comprised of NASA civil servants (or Lab employees for JPL) including early career personnel working at the Center. Center contractors can be used for project implementation support roles but not in roles of management or leadership. The intent is to include the population of people at the Center who intend to have long term associations with NASA. Early career personnel could include NASA Postdoctoral Program (NPP) fellows and co-op students, but the proposal must justify why they should be considered “people at the Center who intend to have long term associations with NASA.” The proposed project team must also be composed of individuals who will benefit from participation in this training opportunity and whose training will benefit NASA and the Center. (Section 4.2.1; also see Section 5.1)

- Q.8 Do we need to specifically call out the personnel participating in the proposed project?
- A.8 Yes. Requirements 16B, 18, and 19 state that the participating personnel need to be identified. The proposal should describe why these individuals are appropriate for this project, and why the Center will benefit through their training.
- Q.9 Can we use mentors as the PM, PI, and SE?
- A.9 No. All key participants in the project, including these, must be trainees (Section 4.2.1).
- Q.10 Can we appoint mentors for the PM, PI, and SE?
- A.10 Yes, absolutely. The proposal should identify the senior employees by name who will serve as mentors.
- Q.11 Do mentors have to come out of the FTE allocation?
- A.11 No. You can pay for the senior personnel any way you wish. SMD/STP/OCE do not assume that the available funding (\$800K) is necessarily sufficient to conduct a suborbital project. It is assumed that the Center will contribute to the project, and contributing mentors and other personnel is permitted. There is no maximum on the Center contribution.
- Q.12 Regarding the requirement to publish the data, please clarify what is the definition of a reasonable time (Section 4.4)?
- A.12 Given the small amount of funding available, and early career hires who may not be experienced with MO&DA, we did not put a constraint on time, and leave it up to the team to propose what is a reasonable amount of time. The evaluators will consider this in reviewing the proposals.
- Q.13 Regarding the schedule of 15-18 months, what if we can't make the committed schedule (e.g., delayed procurement by our Center), can we get a no cost extension?
- A.13 You must propose to be flight or launch-ready within the 15-18 month schedule constraint. We are looking for good proposals that can be executed within the timeframe allowed and that propose an executable schedule (including schedule margin). There is NO “Get out of jail free” card available upfront. Also, because there is no more money at HQ, any overruns must be paid for by the Center.
- Q.14 The TO uses the term “suborbital” and also specifically includes CubeSats, which are designed and currently deployed in LEO. Will you please confirm that CubeSat missions in LEO are within the scope of the HOPE TO? We understand the proposer must arrange for their own launch services.
- A.14 CubeSats are considered “suborbital class” for the purposes and scope of the HOPE-4 TO. Thus, a CubeSat mission is within the scope of the HOPE-4 TO solicitation. Teams proposing a CubeSat mission must secure their own launch services.

- Q.15 In supporting requests from prospective proposers, is it permissible for organizations responsible for supplying HOPE-sponsored carrier services (e.g., sounding rockets, balloons, aircraft) to have these carrier system team members participate as part of proposals (e.g., as PI or Co-I)?
- A.15 No. The suborbital class launch services providers cannot be PIs, or Co-Is on a given proposal. However, the launch service provider is expected to work with the proposing teams to answer questions and to provide launch service information necessary to formulate the proposal. After selection, the launch service provider associated with the winning proposals becomes a member of the project team, and participates in carrying out the investigation.
- Q.16 Can one assume from sections A.2 and A.7 of the HOPE TO, that the Flight Opportunities Program is providing an orbital launch opportunity for proposed CubeSat missions, with no cost to the proposed project's budget? Further, if one assumes the opportunity is on an ELaNa launch, can you provide expected cost and launch dates?
- A.16 No. While STP is providing access to near space through the platforms provided for under the Flight Opportunities Program (commercial parabolic aircraft and commercial suborbital reusable launch vehicles), the Flight Opportunities Program does not provide CubeSat orbital capability or launch schedule. The HOPE solicitation says (Section 5.3.4) "CubeSats can be supported through the Human Exploration & Operations Mission Directorate (HEOMD) at NASA Headquarters." Section A.8 of the Appendix provides POCs. Also see Question 5 in this FAQ Appendix. Regarding launch cost and schedule for CSLI/ELaNa: HOPE proposers must arrange for and include costs for a launch opportunity for their CubeSat. One such launch opportunity is ELaNa which is free, if ELaNa Program conditions are satisfied. Sometime after application and acceptance by the ELaNa Program, launch manifests are provided. Typical launch manifests are about two years from acceptance.
- Q.17 Are foldouts allowed "in general" - or - are they not recommended??
- A.17 In general foldouts are discouraged because these are electronic proposals and foldouts are very difficult to read on a laptop screen. However they are not forbidden; the applicants can take their own chances with whether the reviewers will find the information helpful or whether the reviewers will find the format annoying.
- Q.18 Is it acceptable to be flight ready within 18 months, but stand down the team until our flight opportunity several months later?
- A.18 Yes. From section 5.3.6: "The selected project must be launch or flight-ready within 15 to 18 months from the selection date." It is accepted that once your payload is flight ready within 15-18 months, the launch provider may not be able to launch your payload until a later time, such as, in conjunction with a planned campaign or launch opportunity.

Q.19 Must the proposers cover the costs associated with the oversight function provided by the Earth System Science Pathfinder (ESSP) Program Office at the NASA Langley (sections 4.1.2 and 7.4.2)?

A.19 No. SMD provides the necessary resources for the ESSP management responsibilities called out in sections 4.1.2 and 7.4.2, “to maintain an essential degree of oversight of the project development...the Earth System Science Pathfinder (ESSP) Program Office(ESSP) at the NASA Langley Research Center will provide the programmatic oversight for this effort”.

Q.20 Please clarify the importance of the HOPE-4 TO goals versus the evaluation criteria. Is the evaluation criteria indeed evenly weighted?

A.20 The primary goal of the solicitation is the most important, but all three evaluation criteria are evenly weighted. Your proposal should address the goals called out in the TO as well as the three elements of the evaluation criteria. From the TO foreword: “The primary goal of this solicitation is: To provide a hands-on Training project to enhance the technical, leadership, and project knowledge, skills and abilities for the selected NASA in-house Project Team. The secondary goal of this solicitation is:. To fly an Earth or space science payload having a useful purpose for SMD, or to mature or develop a space related technology having a useful purpose to either SMD or to STP.”

The evaluation criteria (Section 7.2) will be equally weighted during the selection process, as listed:

- The merit of the proposed project for personnel development;
- The scientific and/or technology merit and feasibility of the proposed investigation; and
- The technical, management, and cost (TMC) feasibility of the proposed approach for mission implementation, including carrier compatibility.

Q.21 Please clarify the HOPE-4 TO Section 5.4.2. Specifically, who can serve as the "Team Lead", and who is responsible for full mission success. Is HOPE-4 intended to be a PI-led mission?

A.21 HOPE is not mandated to be a PI-led project. The proposal should designate either the PI or PM as team lead and then show how they will work together to oversee and manage the work to carry out the project. From section 5.4.2: “Either the PI or the PM must be designated as the Team Leader. The Team Leader is responsible for the project’s execution within committed cost and schedule. Regardless of which is designated the Team Leader, the PI and the PM must work closely together in order to ensure that the project meets its objectives within the resources outlined in the proposal.”

Q.22 Why is there so much emphasis on mentoring? What is the mentor's role?

A.22 Each team member who is considered to be a trainee under the HOPE program must have a mentor who is expected to be a “shadow member” of the team, continuously providing

expert monitoring, guidance, and advocacy for the trainee in his/her unfamiliar role. While there is no prescribed level of effort for mentors, each mentor should be continuously aware of project status and should be available as needed to discuss with the trainee technical and programmatic options and to provide a problem solving approach the trainee can learn to apply to make appropriate work decisions. Mentors should also plan to attend all technical reviews, not as presenters, but as resources for the trainees.

Q.23 Is it necessary to involve the center's training office or the center's engineering training program in the writing of the proposal or the management of the team training effort?

A.23 Yes. To assure success of both technical and training requirements, the center training office must provide a member on the HOPE project team. This expertise is essential in defining and meeting individual team member and overall project training goals. This also allows the Center to leverage this learning by repackaging knowledge gained by project trainees into other courses and learning events at the center.

Q.24 Is there a list of expected training products that the project should develop? Is there a list of courses that team members are expected to complete?

A.24 See Appendix-C "Training Guidelines and Best Practices for HOPE Projects." Teams should customize the training needed for the team members. The sponsors have found that it is critical that individual learning is achieved within the context of the project and not just for the sake of taking a training course. The sponsors have found that with this context and the quick application of knowledge to real work, people learn faster and retain far more than when they just take courses to gain information.

Q.25 What about training metrics and measures?

A.25 Each trainee should have specific learning goals, reflecting his/her own individual development needs. It is important to document training goals for each individual and to measure his/her own progress against the training goals as the project accomplishes its engineering and program management goals. Each center proposal team is free to develop a measurement framework based upon its own training objectives for the project team members

Q.26 What are acceptable ways to accomplish the secondary goal of the HOPE solicitation?

A.26 This goal can be accomplished either (i) by providing useful (new or complementary) science data in support of SMD science objectives for one of the four SMD Science Divisions or (ii) by advancing the development of technology or capabilities in support of SMD or STP objectives, *e.g.*, by providing reflights of instruments or components, demonstrating a proof of concept, providing flight calibration, or enabling TRL advancement of sensors or technologies for future use.